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Monitor and assess the total damage caused by rodents in various coconut orchards of coastal Odisha

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Abstract

Rodents are serious non-insect pests in some coastal areas of Odisha damaging green tender nuts of coconut palms. Roof rat, *Rattus rattus* L. is the most dangerous rodent species that cause a hole near the perianth region of tender nuts and drink the water content. A survey was conducted in some areas of Coastal Odisha during the year 2015-2016 to know the percent rodent infested palms and nut damage. The results revealed that the percent rodent infestation and nut damage varied from 2.63% to 50.7% and 1.28% to 26.02% respectively. Biraramchandrapur area of Puri district recorded highest percent rodent infested palms (50.70%) and nut damage (26.02%). Monitoring on rodent abundance in coconut plantations during the year 2015-2016 revealed highest trapping index in the month of January, 2016 *i.e.* 25.57%. Biraramchandrapur village recorded highest percent trapping index (12.41%) followed by Oterkera (9.81%) and Resinga (8.33%). Studies also revealed *R. rattus* to be the predominant species (89.57%) in coconut orchards of Coastal Odisha. Thus farmers can be advised to adopt this practice for better management of rodent damage as well as for deriving high profit. Our training on various social engineering activities against rodent control was adopted by maximum farmers giving a positive impact. However further training on rodent damage and their management is required for generating awareness.

Keywords: Rodent infestation, nut damage, trapping index and species composition

1. Introduction

India is the third largest producer of coconut in the world after Indonesia (1st) and Philippines (2nd). The area under coconut production in India during the year 2015-16 was reported to be 2088.47 thousand ha with an annual production of 22167.45 million nuts and productivity of 10614 nuts per ha. The four southern states viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh together account for 90 percent of the total area and production of coconut and there is high variability in productivity owing to production system. The farmers of these states are destined to flourish or perish depending on the fortunes of coconut industry. Other major traditional coconut growing areas include West Bengal, Odisha, Goa, Puducherry, Maharashtra and the island territories of Lakshadweep and Andaman and Nicobar. According to Coconut Development Board, GOI (2015-16), Odisha contributes in production of 328.38 million nuts from area of 50.91 thousand ha with a productivity of 6451 nuts per ha.

The principal identifying feature of a rodent is that one pair of incisors above and below are greatly enlarged and used for gnawing. They are serious pests of agricultural and stored food. They cause direct damage to crops/commodities by gnawing and feeding and also indirect damage by spoilage, contamination and hoarding during pre and post harvest stages. Globally 1750 species of rodent have been reported, which represents about 40 percent of the total mammalian species. About 115 species occur in India and of these, 18 species are pest (Parshad *et al.*, 2007) [9]. In India about ten species of rodents are found to co-exist in coconut and cocoa cropping systems. Among them, the runner rat, *Rattus rattus* L. and the striped squirrels, *Funambulus* spp. are the most important ones.

Though various measures for rodent control like trapping, banding of tree trunks, use of rodenticides and repellents are available, the major problems in their implementation are general neglect, a lack of awareness of economic losses, small land holdings which make rodent control campaigns difficult to organize over large areas, the low education and economic level of farmers and discouragement due to the frequent failure of rodent control operations as a result of the adoption of the wrong procedures of bait formulation and application (Malhi 1998) [10].

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2. Material and Methods

Survey was conducted in different areas of Coastal Odisha during the year, 2015-16 to know the rodent infestation and nut damage on percent basis. Rodent Infestation was calculated using the following formula:

$$\text{Rodent Infestation (RI \%)} = \frac{\text{No. of trees with fallen nuts}}{\text{Total no. of trees}} \times 100$$

For assessment of nut damage (%), 10 rodent infested trees were identified in each block. The total number of damaged as well as healthy nuts was recorded. The nut damage (%) was calculated using following formula:

$$\text{Nut Damage (\%)} = \frac{\text{Total no of damaged nuts}}{\text{Total no nuts (Healthy \& Damaged)}} \times \text{RI}$$

2.1 Monitoring rodent pest abundance in coconut plantations

Monitoring of rodent species through monthly trappings was carried out in coconut orchards of Biraramchandrapur, Resinga and Oterkera of Puri district during the year, 2015-16, to know the species composition and trapping index in percent basis.

2.2 Estimation of Trapping Index

For estimation of trapping index, single catch Sherman traps were used. During evening hour twenty traps provided with

fried snacks as lure were placed at different spots of the orchard. The traps were collected in the morning hour and number of trapped rodents was noted down. The traps were then washed properly with water and sun dried. This process was repeated consecutively for three evenings. The trapping index was calculated using following formula:

$$\text{Trapping Index (TI \%)} = \frac{\text{Number of trapped rodents}}{\text{Total no. of traps}} \times 100$$

2.3 Estimation of species composition

The number of rodent species trapped in single catch Sherman traps per day were noted down and identified properly. The species composition (%) was estimated by following formula:

$$\text{Species Composition (\%)} = \frac{\text{Total number of a particular rodent species trapped}}{\text{Total number of rodents trapped}} \times 100$$

3. Result and Discussion

The results of present studies conducted on rodent pests of coconut pertaining to survey on extent of damage by rodents in Coastal Odisha, monitoring of rodent abundance in coconut plantations have been presented in suitable tables.

3.1 Survey on extent of damage by rodents in various coconut orchards of Coastal Odisha

Table 1: Survey on percent rodent infested palms in various coconut orchards of Coastal Odisha during 2015-2016

Sl.no.	Location	No. Of trees surveyed	No. Of trees with fallen damaged nuts	Rodent infestation (ri %)
1.	Biraramchandrapur	355	180	50.70
2.	Oterkera	178	36	20.22
3.	Resinga	208	42	20.19
4.	Odomba	495	235	47.47
5.	Konark			
	Isaneswar FARM	950	25	2.63
	GOVT. FARM	1075	55	5.12

The results on percent rodent infested palms have been presented in Table 1, The highest percent of rodent infested palms were recorded in Biraramchandrapur village of Puri

district (50.70%) and the lowest percent of rodent infested trees were recorded in Isaneswar farm, Konark of Puri district (2.63%).

Table 2: Taxonomic position of the rodents studied during investigation

Sl. No.	Common name	Scientific name	Sub-family	Family	
1	Roof rat/Black rat	<i>Rattus rattus</i> L.	Murinae	Muridae	Order: Rodentia Class: Mammalia
2	Lesser bandicoot	<i>Bandicota benghalensis</i> Gray	Murinae	Muridae	
3	Three stripped palm squirrel	<i>Funambulus palmarum</i> L.	-	Sciuridae	

The present investigation revealed that Roof rat, *Rattus rattus* L. was the predominant species in coconut plantations (89.57%) followed by *Bandicota benghalensis* Gray (9.39%) and *Funambulus palmarum* L. (1.03) (Table 2). Bhat (1992) has also reported *R. rattus* as a serious pest of orchards in the

southern part of the country. Advani (1987) has reported Bandicoot rats causing damage in coconut nurseries and the Western Ghat squirrel, *Funambulus tristriatus* Waterhouse causing damage to the inflorescence of coconut trees in Western Ghat biome of South India.

Table 3: Survey on percent nut damage in some coconut orchards of Coastal Odisha during 2015-2016

Sl. No.	Location	No. Of damaged nuts	Total no. Of nuts	Nut damage (%)
1	Biraramchandrapur	386	750	26.1
2	Oterkera	78	467	3.35
3	Resinga	73	421	3.51
4	Odomba	186	546	16.2
5	Konark	256	618	1.08

The results on percent nut damage are presented in Table 3, The highest percent nut damage was recorded in

Biraramchandrapur (26.1%) followed by Odomba (16.2%); Resinga (3.51%); Oterkera (3.35%) and Konark (1.08%).

The Rodent Infestation rate (RI %) and nut damage (%) in various coconut farms of Coastal Odisha ranged from 2.63% to 50.7% and 1.08% to 26.1% respectively (Table 4 and 5). The highest percent of rodent infested palms (50.70%) and nut damage (26.1%) was recorded in Biraramchandrapur

village of Puri district.

According to NIPHM, the extent of loss in coconut plantations throughout India due to rodents ranged from 4.5% to 55%. Thus our present survey corroborates with the figures provided by NIPHM.

Table 4: Rodent species composition (%) of coconut orchards during 2015-2016

Month	R.r	B.b	F.p
July	55	45	-
August	94.74	5.27	-
September	91.66	4.17	4.17
October	93.33	3.33	3.33
November	100	-	-
December	98.23	1.77	-
January	98.23	-	1.77
February	100	-	-
March	75	25	-
Mean	89.57	9.39	1.03

Roof rat, *Rattus rattus* (89.57%) was found to be the dominant species in all the three coconut plantations followed by Lesser Bandicoot, *Bandicota benghalensis* (9.39%) and three striped palm squirrel, *Funambulus palmarum* (1.03%). The data on monthly species composition has been presented

on Table 4 that shows *R. rattus* dominating the coconut orchards in every month.

3.2 Monitoring rodent pest abundance in coconut plantations

Table 5: Trapping index (%) of different coconut orchards in Coastal Odisha during 2015-2016

	Biraramchandrapur				Oterkera				Resinga				TI (%) MEAN
	1DOT	2DOT	3DOT	TI (%)	1DOT	2DOT	3DOT	TI (%)	1DOT	2DOT	3DOT	TI (%)	
Jul	2	2	1	8.33	1	1	0	3.33	1	1	0	3.33	5.0
Aug	1	1	0	3.33	0	0	1	1.67	1	0	0	1.67	2.22
Sept	1	1	1	5.0	0	1	1	3.33	1	0	0	1.67	3.33
Oct	1	1	1	5.0	1	2	0	5.0	1	1	0	3.33	4.44
Nov	1	1	2	6.67	2	0	1	5.0	2	0	0	3.33	5.0
Dec	6	4	5	28.33	5	4	4	21.67	4	5	3	20.0	23.33
Jan	6	5	7	30.0	5	7	3	25.0	5	4	4	21.67	25.57
Feb	4	4	3	18.33	2	2	4	13.33	2	3	3	13.33	15.0
Mar	3	1	3	11.67	2	3	1	10.0	3	1	1	6.67	9.45
Mean				12.41				9.81				8.33	

DOT- Days of Trapping; TI (%) - Trapping Index

The results on trapping index (%) have been presented in Table 5, The highest trapping index (%) was recorded in Biraramchandrapur (12.41%) followed by Oterkera (9.81%) and Resinga (8.33%). The trapping index was found to be highest in the month of January and lowest in the month of August for all the three locations.

Our present investigation recorded highest trapping index (%) in Biraramchandrapur village, Puri (12.41%) (Table 5). The mean trapping index was found to be highest in the month of January (25.57%) and lowest in the month of August (2.22%). High trapping index denoted high rodent population in coconut orchards. The reason was found to be barren crop fields left after harvesting of paddy which forced the rodents to move to coconut plantations. Our findings are supported by Bruggers (1979) [3] who had also observed increased rat activity and damage within experimental plots shortly after harvest or land preparation in adjacent rice or corn fields. Reindinger and Libay (1980) [4] also observed increased rat activity when nearby sweet potato and rice fields surrounding coconut experimental plots were harvested.

4. Summary and Conclusion

The results on survey of percent rodent infestation and nut damage in Coastal Odisha varied from 2.63% (Isaneswar farm, Konark) to 50.7% (Biraramchandrapur) and 1.08%

(Konark) to 26.1% (Biraramchandrapur) respectively. It may be concluded from the above results that rodent infestation rate is increasing in an alarming rate in coconut orchards of Coastal Odisha. Thus, attention is needed to manage the rodent damage.

The results on monitoring revealed that the population in coconut plantations was highest during the month of January (25.57%) followed by the month of December (23.33%). After harvesting of nearby paddy plots during the month of December the food supply became scarce forcing the rodents to move to nearby coconut orchards in search for both food and shelter. Thus measures should be taken during these months of the year to protect the coconut palms from severe damage. The highest trapping index (%) was recorded in Biraramchandrapur (12.41%) followed by Oterkera (9.81%) and Resinga (8.33%). The results also stated Roof rat, *Rattus rattus* L. as the predominant species (89.57%) in coconut orchards.

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